4.2 HYDROLOGY AND WATER QUALITY

4.2.1 Environmental Setting

The proposed Project has the potential to cause substantial changes in coastal sand movement and deposition affecting beaches both north and south of the northern inlet to Agua Hedionda Lagoon. The immediately adjacent beaches, North Beach, Middle Beach, and South Beach, have the most potential to be affected because they would be impacted if the proposed Project performs as designed. The following information on the environmental setting is important to understanding these potential Project-related impacts.

Sand suspended in the water column by breaking waves generally moves parallel to the San Diego County coastline and is the natural source of beach-forming sand. This is referred to as longshore transport. Jetties can block the movement of sand and increase or decrease the amount of sand available for beach formation on adjacent beaches. Beaches generally become wider on the up-current sides of jetties, and narrower on the down-current sides of jetties.

Studies have shown the dominant direction of sand movement by longshore transport along the San Diego County coastline is from the north toward the south by a factor of 4:1 (Elwany et al. 1999). That is, the longshore transport in the vicinity of the proposed Project is 80 percent to the south and 20 percent to the north when averaged for the year. The longshore transport from north to south is more dominant during the winter, when the sand movement is only 10 percent to the north versus 90 percent to the south. Sand movement from the south to the north increases in importance during the summer, when transport is 37 percent to the north versus 63 percent to the south. The gross longshore transport, considering northward and southward combined, is estimated as 538,000 cubic yards of sand per year. Since southward longshore transport dominates, the net annual movement of sand is approximately 310,000 cubic yards of sand per year toward the south.

Jetties constructed along the southern California coast can interrupt both the northward and southward movement of sand, and because southward longshore transport dominates, sand tends to accumulate on beaches on the north sides of the jetties and tends to be eroded from beaches on the south sides of the jetties. Artificial replenishment of beach sand typically is focused on beaches to the south of jetties, including in the Project vicinity, where replenishment has largely been focused on Middle and South Beaches to partially offset the erosion caused by the existing jetties.

This typical pattern can be seen in the Project vicinity and elsewhere along the San Diego coast.

Historic and recent aerial photographs, historical survey data, and measured beach profiles were used to document the conditions of North Beach, Middle Beach, and South Beach before and after the construction of the Station, and to understand the past history of sand movement in the immediate vicinity of the proposed Project. The aerial photographs were used to help describe the existing setting and to help determine how the proposed Project might affect the adjacent beaches.

In January 1947 (Figure 4.2-1), there were no jetties in the vicinity of Agua Hedionda Lagoon and the beaches were uniform in width along the length of the coastline. At the tide shown in the photograph, the beach was about 315 feet wide, measured from the edge of Carlsbad Boulevard to the water. The land uses to the north of the Lagoon appear on the photograph to be mixed residential and agricultural, and the land uses to the south appear to be mainly agricultural. The Station was not constructed until 1956, and in the 1947 aerial photograph the Lagoon had not yet been developed as a source of generating station cooling water.

By April 1964 (Figure 4.2-2) the Stationhad been operating for about eight years. The Lagoon had been dredged and enlarged, and its edges had been modified and protected. At this time there were two well-defined breaks in the beach, the northern inlet and the southern generating station outfall. Jetties had been constructed to protect the inlet and outfall. North Beach is shown to be about 215 feet wide at the tide shown in the photograph. Compared with the situation in January 1947, Middle Beach had narrowed immediately to the south of the inlet jetties to about 60 percent of the width of North Beach (at this time about 130 feet wide). Measurements confirm the northern inlet jetties shown in this aerial photograph were the same length in 1964 as they are today, about 378 feet in length. Therefore, by 1964 wave action had shortened the northern inlet jetty from its reported as-built length of about 600 feet.

An aerial photograph taken in April 1996 (Figure 4.2-3) shows Agua Hedionda Lagoon being dredged and the dredged sand being deposited by pipeline on Middle Beach. Such replenishment has mitigated to some extent the effect of the northern inlet jetties on southward longshore transport and the resulting narrowing of Middle Beach. The

Applicant is now required to deposit 30 percent of the sand dredged from the Lagoon to the north of the northern inlet for the purpose of replenishing North Beach. This was required by the California Coastal Commission to mitigate for the effects of the jetties on northward sand movement to maintain a stable beach width at North Beach.

An aerial photograph taken in February 2001 (Figure 4.2-4) shows the conditions just prior to the NOP for this proposed Project being circulated for agency and public review in March 2001. The photograph also shows dredging being performed and the dredge materials being deposited on Middle Beach. Note the flow of water and sand across Middle Beach from the dredge pipeline. In the photograph, the pipeline is shown by a line of floats in the Lagoon, then crosses under Carlsbad Boulevard and discharges onto the beach. North Beach is about 235 feet wide at the tide shown in the photograph, Middle Beach is about 85 feet wide immediately south of the northern inlet, and South Beach is about 150 feet wide.

There are several established beach measurement locations in the vicinity of the proposed Project, including three at North Beach (Stations CB-0850, CB-0840, and CB-0830), one at Middle Beach (Station CB-0820), and one immediately south of South Beach at Terra Mar Point (Station CB-0800). The specific locations of these five measured profile stations are shown in Appendix C, Figure 1. These profiles were measured regularly for a 10-year period between 1987 and 1997. During this period North Beach became more narrow, at a rate of 0.45 feet per year, or about 4.5 feet over 10 years. Beach width at Middle Beach and South Beach at Terra Mar Point increased during the period. Middle Beach advanced at a rate of 5.8 feet per year, probably due to the placement of dredged sediment on this beach. South Beach at Terra Mar Point advanced at a rate of 1.2 feet per year, or 12 feet during the same period, also probably due to the placement of dredged materials. The beach profile measurements also showed the seasonal change in beach width, defined as the distance between a fixed survey point and the reference plane of NGVD, varied from 34.6 feet and 17.8 feet at North Beach and South Beach (Terra Mar Point), respectively.

4.2.2 Regulatory Setting

The City of Carlsbad General Plan (City of Carlsbad 1993) identifies the City's beaches as "Environmentally Sensitive Lands" and "open space lands that are constrained or prohibited from development." The General Plan Open Space and Conservation Element identifies the beaches as citywide priority resources under" Category 1 Open

Space for Preservation of Natural Resources." In addition, the General Plan includes a policy to:

 "Protect and conserve natural resources, fragile ecological areas, unique natural assets, and historically significant features of the community."

The City's beaches are considered natural resources and unique natural assets. Two other relevant General Plan policies are as follows:

- "Participate in programs that restore and enhance the City's degraded natural resources," and
- "Pursue mitigation measures which address the causes of beach sand erosion."

As such, the City of Carlsbad General Plan includes policies that seek to preserve and enhance City beaches. Activities that adversely affect the quality of City beaches, including those reducing beach width, would conflict with the General Plan, while activities increasing beach width would be consistent with the General Plan policies.

4.2.3 Significance Criteria

The following criteria were used to determine whether impacts would be considered significant. The evaluation is posed as a question, as follows.

Would the implementation of the proposed actions:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level, e.g., the production of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onor off-site;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

- Otherwise substantially degrade water quality;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Inundation by seiche, tsunami, or mudflow; or
- Substantially conflict with adopted plans or policies.

4.2.4 Impact Analysis and Mitigation

The proposed Project was evaluated for both the potential short-term impacts related to the reconstruction of the jetty and the potential long-term impacts associated with the effects of the jetty on coastal processes and beaches. The long-term effects of the proposed Project on coastal processes and beaches are discussed in the following. Observable data are discussed first. These are followed by calculations of probable Project-related impacts and the results of coastal processes modeling.

Calculations of Potential Impacts of Project

The potential effects of the proposed Project can be estimated using mathematics, having knowledge of the physical conditions of the Project site, and by estimating the width of the surf zone. Knowing that the slope of the foreshore is 0.0278 (Osborne et al 1983), the width of the surf zone can be estimated from

 $L = 46.1 \, Hs$

where L is the width of the surf zone and Hs is the significant wave height at wave break point. If the maximum Hs is 4.4 feet or more, the width of the surf zone is greater than the current length of the north jetty, which is 205 feet beyond the high water mark (SDG&E, Jenkins and Skelly 1988). (The south jetty is longer, 228 feet, and the Hs would have to increase to 4.9 feet for the south jetty to extend out past the surf zone.) If the north jetty is lengthened by 200 feet, the Hs will have to increase to 8.8 feet, so that the width of the surf zone is greater than the proposed length of the jetty. This is the height of the breaking wave.

To see how often this breaker height will occur, we can use the 1984 Shore Protection Manual to convert the wave height at breaking to the wave height at 33 feet to facilitate comparison with wave data collected by Elwany et al. (1999). Wave data was collected in a water depth of 33 feet from July through September 1998. Using the ratio of the wave height (H) at depth (d) to the wave height in deep water (H_0) ,

$$\frac{H}{H_0} = \sqrt{\frac{1}{\tanh(2\pi d/\lambda)} \frac{1}{\left[1 + \frac{(4\pi d/\lambda)}{\sinh(4\pi d/\lambda)}\right]}}$$

and assuming the wave period is 15 seconds, the wave height at a depth of 33 feet would have to be at least 7.7 feet for the surf zone to extend past the lengthened jetty. We can see from Figure 4.2-5, that waves this high rarely occur at this location (0.13 percent of the time).

Extending the jetty by 200 feet will intercept the majority of the longshore transport. In fact, according to Figure 4.2-6, more than 95 percent of the longshore transport will be intercepted.

Jenkins and Skelly (1988) conclude that most of the sediment transport bypasses the current jetties because the current length of the jetties is less than the surf zone width. They also cite evidence of bypassing from sand tracer experiments, showing 470 cubic yards per day bypassed the inlet jetties from August to December in 1979. Additionally, there is an absence of sediment accumulation offshore as shown from analyzing historical bathymetric surveys, beach profiles, and vibracore samples.

Because nearly all of the longshore transport will be trapped by the extended jetty, the North Beach will grow at the expense of the Middle Beach and possibly the South Beach. To see the effect on the adjacent beach, we use the work of Dean and Work (1993). Assuming that the beach profile responds without change of form and that there are negligible wave diffraction effects due to the jetty, the time that bypassing commences, t_{bp} , is given by (Dean and Work 1993):

$$t_{bp} = \frac{\pi \lambda^2}{4G \tan^2(\beta - \alpha)}$$

where $^{\lambda}$ is length of the barrier, G is longshore diffusivity, β is the outward shore normal and α is the azimuth from which the breaking wave is propagating. Given G=0.029 square yards per second (Elwany et al 1999), $^{\lambda}$ =129 yard, $^{\beta}$ =242° and $^{\alpha}$ is not greater than 10° different from the shoreline normal when the wave is breaking, the time bypassing commences is 200 days or more. The closer the wave approach angle is to the shore normal, the longer the beach will take to fill and no bypassing of sand around the jetty will occur.

The effect of the jetty on the beach can be found by solving the equation for the linearized development of shoreline evolution developed by Pelnard-Considère (1956):

$$\frac{\partial y}{\partial t} = G \frac{\partial^2 y}{\partial^2 x}$$

where x and y are the longshore and shore-normal coordinates, respectively. The solution of the above equation is :

$$y(x,t) = \pm \frac{\tan(\beta - \alpha)}{\sqrt{\pi}} \left[\sqrt{4Gt} \exp\left(-\frac{x^2}{4Gt}\right) - |x|\sqrt{\pi} erfc\left(\frac{|x|}{\sqrt{4Gt}}\right) \right] \text{ for } t \le t_{bp}$$

$$y(x,t) = \pm \lambda erfc \left(\frac{|x|}{\sqrt{4Gt}} \right)$$
 for t> t_{bt}

Under the scenario that bypassing commences within 200 days, the jetty will increase the beach width to approximately half the length of the extended jetty, 1,950 feet from the jetty, with the effect of the jetty on beach width tapering 6,000 feet upcoast (see Figure 4.2-6), which would be as far as Christiansen Way in the northern part of the city of Carlsbad. Since all of the longshore transport is being trapped, the erosional effects downcoast can be assumed to affect the same length of beach, 6,000 feet, which would include both Middle Beach and South Beach, extending to about 800 feet south of Canon Road, about mid-way along Shore Drive, in the southern part of the city of Carlsbad.

A long-term reduction in the width of beaches within 6,000 feet of the northern inlet jetty, including Middle Beach and South Beach, would be considered a Class II impact. This

impact could be mitigated through a program of annual beach sand replenishment to assure 2001 widths are maintained at Middle Beach and South Beach.

4.2.5 Impact Analysis and Mitigation

The proposed Project could affect coastal processes by blocking the longshore transport of sand by currents, and thereby affect the width of beaches adjacent to the Project site. Consequently, the hydrology and water quality analysis considers the kinds of effects that might occur and the distance up- and down-coast that the effects might occur. To determine their significance, the effects on the beaches were evaluated for consistency with the adopted policies, objectives, and goals of land use plans regarding beaches and beach widths.

Impact WQ-1: Beach Deposition on North Beach

Impacts to coastal processes and patterns of sand deposition could result in the widening of North Beach (Class IV).

A series of historic and recent aerial photographs was examined to understand how the existing northern inlet jetty might have affected the widths of North Beach, Middle Beach, and South Beach, and thereby help predict the effects of extending the jetty. The absolute measurements of beach width are only approximations because the tides may vary between photographs, the beaches appearing wider at lower tides. However, the relative widths comparing North Beach, Middle Beach, and South Beach are independent of the effects of the tides because the tide affects all three beaches equally at the time of the photographs. The aerial photographs suggest that North Beach narrowed somewhat after the construction of the original northern inlet jetty, and has been relatively stable since 1964 at around 210 to 235 feet wide. Middle Beach, which was the same width as North Beach in 1947, was about 40 percent narrower than North Beach in 1964 after the northern inlet jetty had been in place for about eight years. In 2001 Middle Beach was about 65 percent narrower than North Beach. Also, South Beach, which was the same width as North Beach in 1947, was 35 percent narrower than North Beach in 2001. The narrowing of Middle Beach and South Beach has been a persistent effect of the existing northern inlet jetty for more than 40 years in spite of the Applicant's program of dredge material disposal on these beaches. This information on beach widths from 1947 to 2001 helps understand the conditions that existed at the time the NOP was circulated for the proposed Project in March 2001. Using this experience as a guide, extending the northern inlet jetty by 200 feet has the potential to substantially exacerbate the erosion problems at Middle Beach and South Beach. This

is because a longer jetty, if it performs as designed, would deflect suspended sand even farther offshore at Middle Beach and South Beach.

The fact that the proposed jetty would extend beyond the surf zone increases the possbility of beach erosion impacts south of the proposed Project. The existing jetty ends within the surf zone and suspended sand is known to bypass the jetty. However, the proposed extension might eliminate the bypassing of suspended sand that now takes place unless North Beach naturally builds out and pushes the surf zone out beyond the end of the extended jetty. If North Beach does not naturally build out to the end of the extended jetty, sand bypassing might not occur, and the result would be beach erosion to the south along the San Diego coast, well beyond Middle Beach. This concern is compounded by evidence from the historic and recent aerial photographs showing that the existing jetties have not caused North Beach to naturally build out, as described in the following.

Measured data from profiles on North Beach, Middle Beach, and South Beach during the 10 year period, 1987 to 1997, give more detail than can be derived from the aerial photography interpretation. During this period, North Beach became 4.5 feet narrower, while Middle Beach became 5.8 feet wider and South Beach became 12 feet wider. The widening at Middle Beach and South Beach are considered to have resulted from dredge material disposal during the period. The erosion at North Beach was interpreted by the California Coastal Commission as an impact of the existing northern inlet jetty on northbound longshore transport. This is why the California Coastal Commission ordered the Applicant to dispose of 30 percent of the Agua Hedionda Lagoon dredge material on North Beach. In any event, over a period of more than 40 years, the existing northern inlet jetty has not caused North Beach to build out, as might have been expected in this coastal location.

More recent beach width measurements, made after the implementation of the SANDAG Regional Beach Sand Project in 2001, show increases of 11 feet to 27 feet on North Beach adjacent to the northern inlet, and up to 60 feet at the northernmost extent of Carlsbad State Beach (see Appendix C). There were no lasting increases in beach width at Middle Beach and South Beach.

Considering the performance of the existing jetty, described above, there is concern that sand would again not build out North Beach following the proposed extension of the jetty. This is important because the building out of sand on North Beach is believed to

be necessary to assure that suspended sand will be bypassed beyond the current surf zone.

Long-term reductions in the width of Middle Beach and South Beach would be considered Class II impacts. These impacts could be mitigated through a program of annual beach sand replenishment, as necessary, to assure 2001 widths are maintained at Middle Beach and South Beach.

If North Beach is artificially built out, or if sand naturally accumulated to the north of the extended jetty, the proposed Project has the potential to increase the width of North Beach by as much as 410 feet immediately to the north of the extended jetty, decreasing in width toward the north as far as Christiansen Way. Increased beach width is consistent with the City of Carlsbad General Plan, and furthermore is considered a Class IV beneficial impact since it would advance the City of Carlsbad policies related beach enhancement and erosion protection. No mitigation is required for Class IV beneficial impacts.

Mitigation Measure for WQ-1: Beach Deposition on North Beach

MM WQ-1: No mitigation is required.

Impact WQ-2: Beach Width Reduction on Middle Beach and South Beach

Impacts to coastal processes and changes in sand deposition and erosion could reduce the widths of Middle and South Beach (Class II).

The proposed Project has the potential to cause substantial short- and long-term increases in erosion for a distance of about 1 mile south of the northern inlet. This would include Middle Beach and South Beach. Decreased beach width would conflict with the policies contained in the City of Carlsbad General Plan. Therefore, this is considered a Class II impact and mitigation is required.

Several other nearby jetties were considered to help predict the effects of the proposed Project on coastal processes and adjacent beaches. These included jetties at Dana Point Harbor, Newport Bay Harbor, Oceanside Harbor, and Mission Bay. The jetty at Dana Point Harbor, constructed in 1968, was not instructive because longshore transport is not a factor in this location, at the extreme northern edge of the Oceanside Littoral Cell and cut off from the San Pedro Littoral Cell by Dana Point. In another instance, jetties in Newport Bay Harbor, dating from 1918 and 1936, were constructed in conjunction with a Newport Bay Harbor maintenance-dredging program and adjacent

beaches are artificially maintained in a stable condition by regular dredged material disposal. The jetties at Mission Bay and Oceanside Harbor, however, are affected by longshore transport and provide some information helpful in predicting impacts of the proposed Project.

Three jetties were constructed in Mission Bay. The first, the north Mission Bay Jetty, was constructed in 1950, and the second and third were constructed in 1970, the latter designed to stabilize the entrance to Mission Bay and the mouth and lower reach of the San Diego River. A wide fillet of sand has accumulated just north of the northern-most jetty, showing the expected pattern of increased deposition and beach widening on the north side of jetties within the Oceanside Littoral Cell. Dog Beach, located south of the southern-most jetty, has not narrowed. Apparently, Dog Beach is replenished both by the San Diego River and by the periodic replenishment by dredged sand (Shaw 1980).

Oceanside Harbor lies 5.4 miles north of the proposed Project and has some important similarities to Agua Hedionda Lagoon. Like the Agua Hedionda Lagoon, Oceanside Harbor is a major coastal feature that is affected by sand deposition and must be routinely maintained through dredging. The incoming tides carry suspended sands into Oceanside Harbor and predominantly the suspended sands are moving from north to south, carried by the longshore currents parallel to the coastline. A 2,050-foot-long breakwater jetty was constructed in 1942 to reduce the amount of suspended sand entering the harbor from the north and 6.8 million cubic yards of sand were placed on adjacent beaches to mitigate for the resulting beach narrowing south of the breakwater. The breakwater was extended in 1958 to its present length of about 4,350 feet.

The width of beaches north of Oceanside Harbor increased following the construction of the breakwater. The maximum amount of increase was about 400 feet immediately north of the breakwater, tapering to an increase of 50 feet at a distance of 15,000 feet north of the breakwater.

Harbor Beach, located south of the breakwater has been most affected by narrowing, losing about 200 feet of its pre-Project width immediately south of the harbor (Figure 4.2-7). The amount of beach narrowing diminished gradually with distance from the harbor, affecting about 8,500 feet of the coastline south of the harbor. Oceanside Harbor and the city of Oceanside over the years have constructed jetties along Harbor Beach to stem erosion and enhance beach formation. These additional jetties have been successful. Shortly after the creation of these structures in 1961 and 1968, the width of Harbor Beach increased by about 350 feet, from its then width of 150 feet to a

resulting width of 500 feet. This is probably the result of the additional jetties combined with periodic sand replenishment by material dredged from the harbor and disposed of at Harbor Beach.

This review of other jetties located along the San Diego coastline helps confirm there is potential for the proposed Project to result in the widening of North Beach and the narrowing of Middle Beach and South Beach. In addition, beach replenishment can be an effective measure to ensure Middle Beach and South Beach are maintained at pre-Project widths.

Long-term reductions in the width of Middle Beach and South Beach would be considered Class II impacts. These impacts could be mitigated through a program of annual beach sand replenishment, as necessary, to assure 2001 widths are maintained at Middle Beach and South Beach.

<u>Mitigation Measures for Impact WQ-2: Beach Width Reduction on Middle Beach and South Beach</u>

MM WQ-2: Artificial beach sand replenishment south of the northern inlet to maintain 2001 beach widths at Middle Beach and South Beach will be required to reduce impacts to less-than-significant levels. Bathymetric surveys will be required north and south of the jetty before construction and then biannually after construction. The survey range shall extend 4000 feet north of the jetty and 6000 ft south of the jetty. The surveys shall be conducted at the end of the winter (April) and summer (October) seasons and shall extend from the back of the beach to a 45 foot water depth, MSL (closure depth). The survey ranges shall coincide with the historical beach profile ranges in the area, specifically stations CB-0850, CB-0840, CB-0830, and CB-0800). The locations of the historical ranges are given in Elwany et al. (1999). An annual report to the SLC shall be prepared representing the results of the surveys and quantifying the volume of sand to be placed south of the inlet channel on Middle Beach and South Beach.

Rationale for Mitigation

Maintaining the widths of Middle Beach and South Beach to the widths that existing when the NOP was circulated for the proposed Project would assure existing conditions are not substantially changed by the Project. The use of bathymetry from the back of

the beach to a water depth of 45 feet is necessary to assure any substantial changes in beach width are related to a reduction in longshore transport and are not due to seasonal variability. That is, substantial reductions in beach width and reductions in the volume of sand present offshore would confirm the need for sand replenishment.

4.2.6 Impacts of Alternatives

No Project Alternative

The No Project Alternative would maintain the status quo and avoid the potential impacts to beach width, therefore the potential conflicts with adopted plans. The Project objective of decreasing the frequency of dredging in Agua Hedionda Lagoon would not be achieved.

Reduced Maintenance Dredging Alternative

This alternative would avoid the potential impacts to beach width and adopted plans associated with the proposed Project. The Project objective of decreasing the frequency of dredging in Agua Hedionda Lagoon would not be achieved for this alternative, but the underlying objective of reducing capital expenditures related to maintenance dredging would be achieved. Under this alternative, the extent and amount of maintenance dredging in Agua Hedionda Lagoon would be reduced to approximately 150,000 cubic yards, the minimum necessary to maintain a stable tidal prism and to allow sufficient circulation for cooling water. Maintenance dredging causes short-term impacts to water quality, specifically related to increased turbidity. These potential impacts are considered Class III because the increased turbidity would be limited in area and duration, and there would be no change in the longer-term ambient condition. Reducing the amount of dredging in the Lagoon has the potential to keep water velocities lower and therefore avoid accelerated sedimentation.

Offshore Water Intake Structure/Cessation of Lagoon Maintenance Dredging Alternative

This alternative would avoid the impacts to beaches and therefore avoid the potential conflict with adopted plans that seek to protect beaches. The construction would include disturbance to the ocean bottom, and this would increase turbidity. This is considered a Class III impact because the affected area is limited, turbidity is a characteristic of the nearshore environment, and the effects would be short-lived. This alternative would achieve the Project objective of decreasing the frequency of lagoon dredging.

4.2.7 Cumulative Projects Impact Analysis

Both the SANDAG Regional Beach Sand Project and the proposed Project would continue periodic disposal of beach sand upcoast of the proposed Project, which would have the potential to increase the width of the beach north of the upcoast jetty. The amount of beach sand deposited by the Applicant following completion of the proposed Project is expected to be reduced since the extended jetty is designed to reduce the frequency and amount of maintenance dredging. Nevertheless, the cumulative effect, if any, would be an augmentation of the beach and a reduced conflict with adopted plans and policies that favor maintenance of wider beaches. Neither of these projects, as currently proposed, targets Middle Beach or South Beach, and therefore neither would likely reduce cumulative impacts to a less-than-significant level. However, if approved, the proposed Project will include mitigation that obligates the Applicant, as necessary, to maintain Middle and South beaches at 2001 widths, which would mitigate this potentially significant cumulative impact (Class II).

Implemented in 2001, the SANDAG Regional Beach Sand Project increased beach width at North Beach by 11 feet to 27 feet close to the existing northern inlet jetty, and by 60 feet at the northern-most extent of Carlsbad State Beach (see Appendix C). The Applicant's disposal of sand at North Beach may also have contributed to this increase in width. The SANDAG project had no lasting effect on the widths of Middle Beach or South Beach.